T16D06 – 16.1 IB Review

Name……………………………………………

1. Which step in a multi-step reaction is the rate determining step?

A. The first step
B. The last step
C. The step with the lowest activation energy
D. The step with the highest activation energy

2. The rate expression for a reaction is

$$\text{rate} = k[CH_3Br][OH^-]$$

Which is a possible unit for *k*?

A. $mol^2\ dm^{-6}\ min^{-1}$
B. $mol\ dm^{-3}\ min^{-1}$
C. $mol^{-1}\ dm^3\ min^{-1}$
D. $mol^{-2}\ dm^6\ min^{-1}$

3. What happens to the rate constant (k) and activation energy (E_a) of a reaction when the temperature is increased?

A. k increases and E_a is unaffected.
B. k decreases and E_a is unaffected.
C. E_a increases and k is unaffected.
D. E_a decreases and k is unaffected.

4. (a) The table below shows kinetic data for the following reaction

$$C + D \rightarrow E + F$$

Experiment	**[C] / mol dm^{-3}**	**[D] / mol dm^{-3}**	**Initial rate / mol dm^{-3} min^{-1}**
1	2.0×10^{-3}	3.0×10^{-3}	1.0×10^{-6}
2	4.0×10^{-3}	3.0×10^{-3}	2.0×10^{-6}
3	6.0×10^{-3}	6.0×10^{-3}	3.0×10^{-6}

(i) Deduce the order of reaction with respect to both **C** and **D**, giving a reason in each case.

C

D

(4)

(ii) Deduce the rate expression for this reaction.

(1)

(iii) Use data from Experiment 1 to calculate a value for the rate constant for this reaction and deduce its units.

(3)

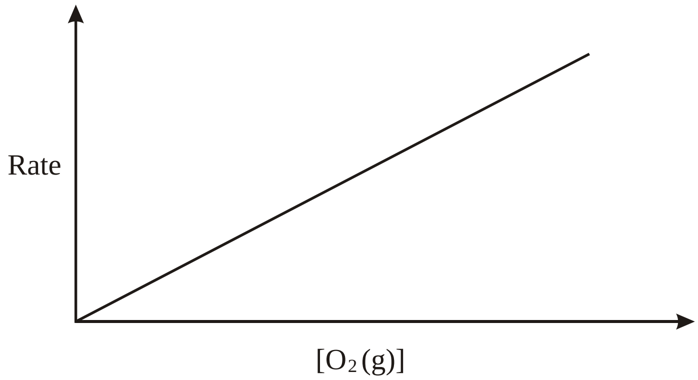
(b) Define the term *half-life* and calculate the half-life for a first-order reaction with a rate constant of $3.3\text{x}10^{-2}$ min^{-1}.

(2) **(Total 10 marks)**

5. Oxygen and nitrogen monoxide react together to form nitrogen dioxide.

$$O_2(g) + 2NO(g) \rightarrow 2NO_2(g)$$

The graph below shows how the initial rate of reaction changed during an experiment in which the initial [NO(g)] was kept constant whilst the initial [O_2(g)] was varied.



(a) Deduce, giving a reason, the order of reaction with respect to O_2

(2)

(b) In a series of experiments, the initial [O_2(g)] was kept constant while the initial [NO(g)] was varied. The results showed that the reaction was second order with respect to NO. Sketch a graph to show how the rate of reaction would change if the initial [NO(g)] was increased.

(2)

(c) Deduce the overall order of this reaction.

(1)

(d) State and explain what would happen to the initial rate of reaction if the initial concentration of NO was doubled and that of O_2 was halved.

(3)

(e) When the initial values are [O_2(g)] = 1.0×10^{-2} mol dm^{-3} and [NO(g)] = 3.0×10^{-2} mol dm^{-3}, the initial rate of reaction is 6.3×10^{-4} mol dm^{-3}s^{-1}. Write the rate expression for this reaction and calculate the rate constant, stating its units.

(4)

(Total 12 marks)